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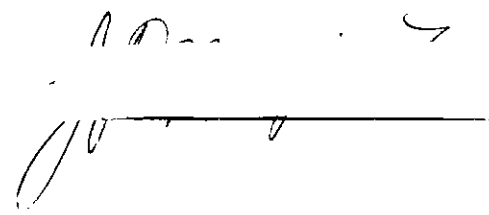

PLANNING FOR PERUVIAN COASTAL FISHING COMMUNITIES

A THESIS

Presented to

The Faculty of the Graduate Division

by

Jose H. Murgia

In Partial Fulfillment

of the Requirements for the Degree

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Approved:

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SUMMARY

The rapid growth of the fishing industry has produced an impact on the economic, social and physical aspects of the life of the Peruvian coastal communities.

The purpose of this study is to suggest methods and programs for the promotion of fishing and related industries as well as public works, services and controls that the growth of such fishing communities demand.

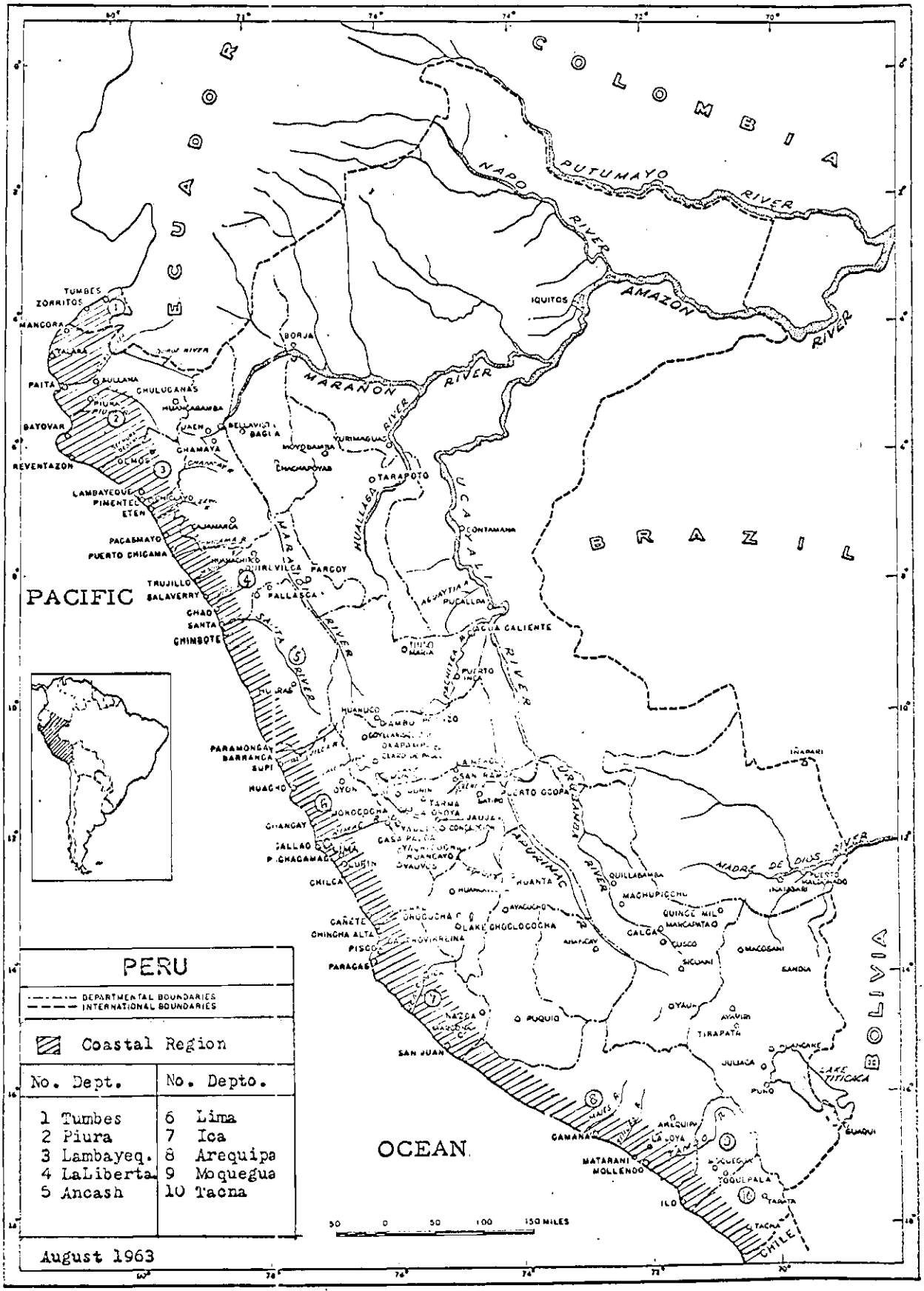
The study analyzes the growth and existing situation of the fishing industry and its impact on land use, transportation, utilities, economy and living conditions in the coastal fishing communities. This analysis points out the physical deficiencies and disadvantages for economic growth as well as the assets of the coastal fishing communities.

The next area of investigation is the existing governmental setup of Peru so far as it is related to economic and physical planning. The results of this investigation point out that the coastal fishing communities as well as the rest of the Peruvian communities do not have the necessary agencies to exercise economic or physical comprehensive planning.

Comprehensive planning for the Peruvian communities under planning agencies is the main recommendation of this study. The economy of the coastal communities can be guided by the policies of the

Industrial Bank ard the proposed Development Corporation. The comprehensive physical growth of the coastal communities can be guided by the policies of the proposed national Planning Directory and municipal planning departments. The policies of these planning agencies should include, but not be limited to, the preparation of: (1) population studies, (2) economic base studies, (3) land use plans, (4) transportation plans, (5) utilities plans, and (6) housing plans.

The implementation of these plans and studies remains as the responsibility of the executive agencies of the national and local governments with the cooperation of the private sector.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CHAPTER I

THE PERUVIAN FISHING INDUSTRY AND PERUVIAN COASTAL FISHING COMMUNITIES

The Peruvian coastal fishing communities have been experiencing the growth of a modern fishing industry. The growth of this industry has been more noticeable in the communities that were already suited and dedicated to fishing activities. Other fishing communities have also experienced growth, although less dramatically.

The physical and economic elements of the fishing communities have changed as the fishing industry has developed. This chapter presents the physical and economic background of the fishing industry and the related background of the coastal fishing communities.

Physical and Economic Background of the Peruvian Fishing Industry

The development of the Peruvian fishing industry is due to the combination of a suitable type of coast, a sea rich in sea life, and a growing demand for sea products.

Topography of the Peruvian Coast

Peru is divided by the Andes mountains into three natural regions: Coast, Highlands and Jungle.

The Peruvian coastal region consists mainly of a desert plain crossed by relatively narrow valleys. The plain has an average width

of 62 miles and has 1,400 miles of coastline on the Pacific Ocean.

The Peruvian coastal region has two types of topography: (1) low coast with flat, and gentle shores; and (2) high coast with rocky and fairly steep shores, especially where small ranges of the Andes come down to the sea. The area north and south of the port of Salaverry is a transition zone between these two types of coast. Port development on the low coast requires protective works such as breakwaters. The high coast has natural advantages for port development such as natural bays.

The continental shelf off the Peruvian coast varies from 30 to 60 miles in width. It is widest—60 miles wide—at the transition zone from low coast to high coast. Off-shore from Lima the continental shelf reaches a width of 40 miles. The shallow continental shelf offers good characteristics for port development along the low coast, where protective works can be built easily. Along the high coast the deeper continental shelf reduces the amount of required dredging.

Peruvian Coastal Waters and the Humboldt Current

The Humboldt current is a cold sea current that flows northward close to the western shoreline of South America. In the latitude of Peru it flows close to the shore and it influences strongly the climate of the Peruvian coastal belt and the sea waters off the Peruvian shore.

Coastal Waters and Sea Life. The northward movement of the Humboldt current at 15 miles per day reduces the tidal effect of the Pacific Ocean on the Peruvian shores, creating a fairly gentle movement of sea water on and along the shore. This gentle movement benefits

port development and, combined with the topographic characteristics of the continental shelf, provides adequate fish spawning sites.

The Humboldt current modifies the temperature of the Peruvian coastal waters. Sea waters in a tropical zone are usually warm but the current brings cold water. Peruvian coastal waters have a temperature range from 59 Fahrenheit degrees in the winter to 70 Fahrenheit degrees in the summer.

The absence of rough waves in the Peruvian coastal waters, the relatively cold temperature of the sea water all the year round, and the existence of a wide continental shelf create excellent conditions for plankton proliferation. Thus, the Peruvian coastal waters are year round suppliers of fish.

Type and Amount of Fish. More than 100 edible species of fish have been identified in the Peruvian coastal waters 1/. Among them the most important are the anchovy and bonito.

In 1961 the total Peruvian catch was over 5.2 million tons (metric): 96.1 per cent were anchovy and 1.9 per cent were bonito 2/. Catches of anchovy, bonito, and other species are made all the year round. The amount of the catch is relatively constant, although the spring, summer and fall months are the most productive.

Catches of other species, such as tuna, sword fish, shark and whale, are made off the northern coast of Peru. The catch of these species and others is not as consistent as the catch made off the

central part of the Peruvian coast because the water conditions are less stable.*

Fishing Industry Development

Prior to 1939, fish caught off the Peruvian shores were not used as raw material for industrial processes. At the beginning of the Second World War the world demand for food created the opportunity for the production of salted fish on a large scale in Peru. Since then the fishing industry has progressed steadily. After the Second World War some canning factories were established. Their products were accepted nationally and internationally 3/. These factories made fish flour as a by-product. Fish flour, mainly used for feed, became the principal product of the Peruvian fishing industry when anchovies were reduced directly to fish flour. This process began in 1947 4/. Since 1947 the production of fish flour in Peru has increased. Today, Peru is the largest producer of fish flour in the world. Statistics in the following sections show the extraordinary growth of fishing activities in Peru during the last ten years.

Trends of the Catch. In 1960 the world's catch amounted to 37.7 million tons (metric). Until 1959 the countries with the largest catches were Japan, China, Russia, United States, and Norway. During the early fifties Peru, for the first time, figured significantly in

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* There the Humboldt current flows to the west as it approaches the equator, and the temperature of the sea waters is altered to the detriment of plankton abundance.

world fish statistics. The following table shows the increases in the Peruvian total catch since 1953.

Table 1. Peru's Ranking in the World's Fish Catch, 1953-1960 5/

Year	Ton Metric 1000	Place
1953	117.8	29th
1956	267.3	22nd
1957	453.1	16th
1958	900.2	9th
1959	2122.3	5th
1960	3531.4	3rd

In 1960 the Peruvian catch amounted to 6 per cent of the world's total. During 1961 and 1962 the Peruvian catch has continued to grow. By 1962 Peru's anticipated catch of more than 5.3 million tons (metric) was exceeded only by that of Japan.

Uses of the Catch 6/. Fish caught in Peruvian coastal waters are used for two main purposes:

1. Fresh food, and
2. Industrial processing.

In 1961 the total catch was 5,213,059 tons (metric). Out of this total, 2.2 per cent were consumed locally: 0.6 per cent (30,527

metric tons) was salted for later distribution and consumption and 1.6 per cent (83,010 metric tons) were distributed immediately in the local food markets while still fresh. Lima, with more than half of the population of the coast, used 37 per cent of the amount of fresh fish. The other 63 per cent was used by the other coastal cities.

The remaining 97.8 per cent of the total 1961 catch went through one of four industrial processes:

1. Freezing. The production of frozen fish in 1961 was 22,302 metric tons, 22.6 per cent greater than in 1960. The most important species used for this process were tuna, barrilete and bonito.

2. Canning. The production of canned fish in 1961 was 24,075 metric tons, 3.3 per cent greater than in 1960. Bonito was the most commonly canned fish.

3. Reducing. Fish flour and fish oil are obtained by a process of reduction of the entire fish. Fish flour and fish oil are the main products of the Peruvian fishing industry. Peru was the world's largest producer of both products in 1961. In that year the production of fish flour and fish oil amounted respectively to 839,815 and 118,885 metric tons. The most common fish used in this process is the anchovy. In 1961, 96.1 per cent of the total Peruvian catch were anchovy.

4. Salting. Bonito and caballa are the fish commonly used in this process. In 1961 the production was 15,263.6 metric tons, 34.9 per cent greater than in 1960.

The uses of the catch as outlined make up the demand for fish as raw material in the Peruvian fishing market. The organization of this market is the topic of the next section.

Organization of the Market. The market in which the Peruvian fishing industry operates has three sectors:

1. Demand and supply of fresh fish for food;
2. Demand and supply of fish as raw material for industrial processes; and
3. Demand and supply of manufactured fish products.

The demand for fresh fish is mostly from Peruvian population concentrations. The supply of fresh fish has been a traditional activity for fishermen all along the coast. These fishermen usually depend on distribution setups that deliver the fresh fish where the demand exists. The distribution of fresh fish is a quick and daily operation done essentially by truck.

The demand for fish as a raw material comes from the fish-processing factories. Some of the factories have their own fleets of fishing vessels that supply them with the necessary fish. The rest of the factories are supplied by private fleets or individual fishermen.

The demand for manufactured fish products is mainly from foreign markets. To meet such demand the factories rely on a wholesale organization. The bulk of the production of the Peruvian fishing industry is exported to Europe and North America. The Paris Agreement,

signed in 1961 by world fish flour producers, established a quota of 750,000 tons (metric) of fish flour for Peru 7/. Other Peruvian manufactured fish products that are in demand in the world markets are fish oil and canned fish.

The acceptance in the world's markets of fish products manufactured in Peru assures a promising future for the Peruvian fishing industry. It is imperative for the industry to supply its markets with products of improved quality in order to retain and increase the foreign trade.

Background of the Peruvian Coastal Fishing Communities

The communities located on and in the vicinity of the waterfront of the Peruvian coast have been traditionally the center of the fishing activities in Peru. The industrial growth of the fishing industry, in the last 20 years, has been the most important factor in the development of the Peruvian coastal fishing communities.

For explanatory purposes, this section will analyze the Peruvian coastal fishing communities as they existed before and after the recent, rapid growth of the fishing industry.

Coastal Fishing Communities Before the Growth of the Fishing Industry

Prior to the growth of the fishing industry there were two types of coastal fishing communities, differentiated by their terminal facilities.

1. One group of coastal fishing communities had limited loading and unloading facilities or none at all. These communities were the

center of operations for fishermen concerned with the supplying of domestic demand for fresh fish. In general these communities served small fishing boats for unloading operations only. The port of Supe is an example.

2. The other group were port cities with modern loading and unloading facilities. They were few in number on the Peruvian coast. They were equipped mainly to allow the loading and unloading with speed and efficiency of goods for the export and import trade. The fishing activities in these port cities did not have too much importance. The ports of Chimbate and Callao are examples.

Coastal Fishing Communities After the Growth of the Fishing Industry

Both of the older types of coastal communities were found to be suitable for the recent, rapid growth of the fishing industry.

This growth was paralleled by the establishment of an increasing number of fish processing factories. In 1940, there were two fish-processing factories operating on the Peruvian coast. In 1961, the number of factories was 233 8/.* As a result, the operations of unloading fish and loading processed fish increased considerably. The unloading operations increased to serve the demand for fish created by the increasing number of fish processing factories. The loading operations increased to export the manufactured fish products bound for foreign markets.

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* This number of factories comprised: 7 freezing, 26 canning, 101 producing fish flour, and 89 producing fish oil 8/.

The increase of fish-handling operations has demanded new terminal facilities in some coastal communities. It also required the improvement of the existing terminal facilities in others.

In spite of these recent developments the twofold classification of the Peruvian fishing communities remains generally valid. There are still basically two types:

1. The more efficient and modern port cities; and
2. The less developed communities.

The difference between the two types of communities is also reflected in their varied success in attracting fish processing factories. The communities that were successful in attracting these factories have been able to do so because of quality of their terminals and transportation facilities.

Terminal facilities are important factors influencing the location of fish processing factories. The fishing industry needs terminal facilities for the two purposes of unloading the fish for factories or fresh food markets, and loading the manufactured fish products for export. Therefore the logical location of a fish factory is on a site reasonably near to the terminal facilities to allow speedy and efficient loading and unloading operations. Good illustrations of the effect of terminal facilities on the location of fish-processing factories are provided by the ports of Chimbote and Callao. These two port cities are among the five most important ports in the world for the handling of fish. Almost three-fifths of the 1961 Peruvian catch was unloaded in these ports and delivered to nearby factories 9/.

Transportation facilities also play an important part in influencing the location of fish factories and in connecting fishing communities with markets for fresh fish. The Peruvian section of the Pan-American highway, running parallel and close to the coast, performs two functions.

First, this highway connects fishing communities directly or through access roads. In doing so the highway has influenced the location of fish factories in communities whose terminals facilities allow only unloading operations. This is possible because, through the transportation facilities, other coastal communities that have loading facilities are within easy reach of the fishing communities which have only unloading facilities. Thus the fish processed in the communities without loading facilities may be easily transported by road to the ports with loading facilities. This arrangement is economically feasible because it is easier and cheaper to transport the processed fish products than the fresh fish. Several factories located in fishing communities close to Chimbote and Callao are examples of such an arrangement. The factories in these communities use the highway to export their processed products through Chimbote and Callao.

Second, the Pan-American highway in Peru and its access roads connect fishing communities with fresh fish markets. The availability and quality of such roads make possible the quick transportation of fresh fish for domestic consumption in the urban centers. Transportation enterprises using refrigerated trucks are in the process of

increasing their operations. Proof of the widespread use of highways and access roads for the transportation of fresh fish is the fact that Lima draws fresh fish from ports located 750 miles north and south from it, such as Paita and Camana respectively 10/.

This chapter has described the Peruvian fishing industry and the communities in which that industry has developed. The next chapter is concerned with an analysis of the impact of the fishing industry on the coastal communities.

CHAPTER II

EFFECT OF MODERN FISHING ACTIVITIES ON PERUVIAN COASTAL COMMUNITIES

The growth of the fishing industry in the coastal fishing communities has affected three basic elements of these communities: the physical pattern, the economic structure and the social structure. The effects of the growth of the fishing industry on coastal fishing communities will be the subject of the following sections.

Effects on the Physical Pattern

The establishment of fish-processing factories, the increase of the loading and unloading operations, the greater amount of fish products to be transported and the increased demand for water and other utilities for industrial and domestic uses suggest that the effects produced by the growth of the fishing industry on the physical pattern of the coastal fishing communities can be analyzed under three headings: Land Use, Transportation and Utilities.

Land Use

The land use of the Peruvian coastal fishing communities has been influenced by the growth of the fishing industry. With the increase of unloading and loading operations land has been dedicated to the construction or enlargement of terminals. At the same time, with the establishment of fish processing factories, land has been dedicated

to industrial uses.

The resulting land use relationships of new and old are not always desirable.

Land for Terminals. The growth of fishing activities has depended on the availability of shipping terminals. Consequently the Peruvian coastal fishing communities are centered around these terminals. The existence and size of these terminals depend on the topographical characteristics of the waterfront, such as type of shore and depth of the sea, because they affect the size of wharves and related facilities.

The communities without terminals have managed to increase their fishing activities. However they continue to use traditional methods: boats mainly propelled by sails or paddles, and fish unloaded on the beach.

The more efficient the terminal facilities the greater the number of fish processing plants that have been attracted to the community. The demand of these plants for fresh fish resulted, in several communities, in the enlargement or improvement of the terminals. These improvements have been built on the waterfront adjacent to the existing installations. Sometimes the improvements demand protective works, such as sea walls, because of the natural formation of the shore. In other cases shores dedicated to residential or bathing purposes were sacrificed to make room for the terminal improvements that have created polluted areas and a resulting incompatibility of land uses.

Land for Industry and Other Uses. The factories that process

fish have a tendency to locate close to terminal facilities in order to reduce transportation and to use the sea for waste disposal. Thus sites that were previously devoted to either residential or commercial purposes close to the waterfront and in the neighborhood of the terminals are now devoted to industrial use. Where sites close to the terminals were not available, others farther inland towards the center of the communities are chosen. In this latter case the importance and need for major roads and sewerage facilities have increased.

The rapid growth of the fishing industry has produced unexpected and uncontrolled growth of the Peruvian coastal fishing communities. Two main land-use problems have arisen due to this uncontrolled growth:

1. Misuse of land. Developers looking for the maximum industrial convenience have put sites, better suited for residential or recreational purposes, especially close to the shore, into industrial uses.
2. Conflict between industrial uses and other land uses because of air pollution fumes and odors. These problems appeared because of the lack of consideration of prevailing wind direction, and the lack of control of the emission of fumes (especially in the manufacture of fish flour).

Transportation

In the Peruvian coastal fishing communities, the movement of fresh fish from the fishing vessels to the factories or local markets, of processed fish products from the factories to the vessels heading for foreign markets, and the movement of people within and between the

coastal fishing communities are closely related to terminal facilities, street patterns and the highway system.

Terminal Facilities. The growth of the Peruvian fishing industry has depended partially on the quality and efficiency of terminal facilities such as wharves, cranes, and storage facilities. These facilities ease the unloading and loading operations, especially when the vessels can be docked.

The objective of the unloading operations is to put on shore the catch brought by the fishing vessels. The fishing vessels used by the Peruvian fishing industry have an approximate capacity of 5 tons. These vessels are relatively small. Terminal facilities to unload the catch from those vessels are relatively easy to build. A large number of small Peruvian coastal fishing communities are so equipped.

The objective of the loading operations is to put the processed fish product on the vessels that will carry them to foreign markets. These vessels are large cargo carriers and demand large terminal facilities. Only a few Peruvian coastal fishing communities, among them Callao and Chimbote, have the necessary terminal facilities to load these vessels without transshipment.

The growing fishing industry has tended to use existing terminal facilities to the fullest. It has also demanded the improvement or installation of such facilities where necessary. Backed by the sound growth of the fishing industry, there is a trend towards the improvement of terminals and terminal facilities.

Street Pattern. The street pattern of Peruvian communities has been designed to serve a high density development where walking plays

an important role. This is the result of street design made when there was little vehicular movement.

The rapid growth of the fishing industry increased considerably the use of trucks for the transport of fish from the terminals to the factories or from the terminals to the nearest highway. The increased heavy traffic has necessitated the conversion of streets that were not designed to carry heavy traffic into major thoroughfares. Land uses along these thoroughfares have begun to change from residential to commercial and industrial uses.

Highway System. Fishing communities that do not have factories to process fish depend on the highway system to market their catch. With an efficient highway system the population and industrial centers become markets for these catches.

The Peruvian section of the Pan-American highway runs close to the shore line all along the coast. The small coastal fishing communities use this main highway to link themselves with the markets. Better access roads connecting the fishing communities with the main highway have become necessary to make the highway system efficient.

The design of the intersections of the main highway with the access roads has received little consideration. This lack is one of the results of fast growth.

Utilities

The rapid growth of the Peruvian fishing industry is responsible for the increase in the number of fish processing factories in the Peruvian coastal fishing communities. The establishment of these

factories has created jobs which have contributed to an increase in the population of the coastal fishing communities.

The rapid increase of fish processing factories and of population has put an unexpected burden on the coastal fishing communities' utilities and services: water supply, sewage disposal, and electric power supply.

Water Supply. Water supply in the Peruvian coast is limited. For the majority of the fishing communities, wells are the only source of water because only few rivers in the coast have enough water all the year round.

The establishment of a fish factory in one of the coastal communities means a considerable increase in the demand for water. Each factory producing fish flour requires approximately 150 cubic feet of water per ton of output of fish flour.* Some communities are able to supply the demand of one or more factories. This is the case of Chimbote and Callao. In the communities where the supply of water was sufficient for domestic purposes only the factories had to dig their own wells. This was also required in communities having no water supply.

The rapid increase of water demand due to industrial growth has meant, in several instances, expansion and improvement of existing water works. Some communities cannot afford to supply the water demand.

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* This figure was estimated by considering the amount of sewage produced per ton (metric) plus the water consumed as steam per ton (metric) 11/.

Thus they are competing disadvantageously with communities that do offer water services to attract new fish-processing factories.

Sewage Disposal. The manufacture of fish flour creates 120 cubic feet of residual water per ton of fish flour produced 12/. This residual water, a liquid with a high concentration of organic matter, is called stickwater. Thus far the fish flour factories have not concentrated the stickwater to recover the organic matter which later can be reduced to fish flour. Although the concentration of stickwater is technically and economically feasible, the stickwater is being disposed of as sewage.

Where the factories are served by a sewerage system, the stickwater increases considerably the amount of organic matter in the sewers, speeding up a biochemical process that corrodes the pipes and shortens their life. This is especially true of concrete pipes. This has occurred in several main sewer lines in the port of Callao. This biochemical process produces hydrogen sulfide gas through an anaerobic reduction of sulfates in the organic matter. This gas reacts with moisture in the pipeline and with water droplets standing on the pipe walls. The resulting product is sulphuric acid that, reacting with the calcium carbonate of the concrete, corrodes the pipe walls 13/.

Where the factories dump their wastes directly into the sea, the sea is contaminated 14/.

To summarize, the fishing industry has created a water pollution problem which:

1. Harms the sewer systems;

2. Reduces the use of sea waters and shores for recreation purposes; and
3. Reduces the desirability of shoreline areas for residential purposes due to coastal water pollution.

Electric Power. The supply of electric power in the Lima-Callao and Chimbote areas is adequate. The factories located in these areas are able to secure electric power at industrial rates. This is one of the factors that has determined the location of the majority of the fish processing factories in these two areas.

The electric power supply in the small fishing communities is considerably less than in the Lima-Callao and Chimbote areas, because Peru does not yet have a program of rural electrification. In the smallest communities the factories must provide their own power.

Economic Impact

The growth of the Peruvian fishing industry has influenced:

1. The national economy as a whole, and
2. The local economies where it has developed.

Impact on the National Economy

On one hand, the base of the national economy has become more diversified with the growth of the fishing industry. By 1960 the Peruvian fishing industry had become the third largest source of foreign exchange for Peru 15/. The first and second largest sources of foreign exchange in 1960 were copper with $94.7 million, and cotton with $73.3 million. The value of exports of fish and fish products, mainly fish flour, has increased from $5.8 millions in 1950 to a record

value of $52 million in 1960 15/. This increase has been beneficial to Peru because it has diversified the base of the Peruvian economy and has reinforced the Peruvian balance of international payments.

In addition, the fishing industry is a strong source of revenue for the national government. Owing to the increased exports of fish and fish products, the government has collected more export duties. Although duties vary according to the international value of the products, revenues in 1960 amounted to $1.5 millions, four times as great as those in 1950 16/.

Impact on the Local Economies

The development of the fishing industry along the Peruvian coast has contributed to the decentralization of industrial activities in Peru and has strengthened the economies of the coastal fishing communities. Basic and service industries have developed and municipal income has increased.

Basic and Service Industries. The use of fish has created basic industries and service industries.

Basic fishing industries are the heart of the fishing industrial growth. They are the fishing, itself, and the factories for freezing, canning, reducing (production of fish flour and fish oil), and salting of fish. The number of plants that make up these basic industries has increased from two in 1940 to 233 in 1960. There are many opportunities to improve the efficiency of these plants. For example, in the manufacture of fish flour, a by-product that is being wasted as sewage is the stickwater.

Service industries have developed to meet the needs of the basic industries. Service industries developed in the Peruvian coastal communities around the processing of fish include boat building, boat maintenance, manufacture of fishing gear, manufacture of paper sacks, labels and tin cans and the distribution of manufactured products. The service industries support the basic fishing industries, but there is still room for their development or improvement. For example, nets are being imported although the Peruvian textile industry is already producing them 17/, and fish flour can be used to manufacture crackers and noodles provided that the flour is first refined and made suitable for human consumption.

The development of the industrial activities mentioned above has created jobs. From 1950 to 1958 the number of fishermen increased from 6,200 to 15,000 18/. In 1961 it was estimated that 25,000 people were engaged as fishermen and employees, laborers and technicians in the fishing industry 19/. This estimate does not include jobs in the service industries.

Municipal Income. The growth of the fishing industry has increased municipal revenues. The demand for municipal services has increased and the issuance of licenses and permits is growing. This is true even in the small coastal communities where there is no industry operating but where the fishermen are increasing in number. Revenue increases are greater in communities where fish factories are located. The city of Supe is a good example. In this city, in less than two years, the number of factories increased from one to ten and city revenues increased by 600 per cent, and from $3,000 in 1959 to $18,000 in 1961 20/.

Social Impact

The development of the Peruvian fishing industry has accelerated the movement from rural to urbanized communities. Job opportunities and better wages created by the fishing industry, combined with the urbanized environment of the coastal fishing communities, have attracted people into these communities. The immigrants now living and working in these communities have undergone adjustments of living conditions and occupations.

Living Conditions Adjustments

The newcomers into the coastal fishing communities, mainly people from the highlands, have had to adjust themselves to the coastal climate and to the more urbanized life. Except for housing, these adjustments have been fairly easy to accomplish.

The considerable immigration caused by the rapid growth of the fishing industry has produced overcrowding in the Peruvian coastal fishing communities. The fast immigration in conjunction with the high natural increase in population (in Peru around 3 per cent per year) has never allowed the housing supply to catch up with the population. For example, the population of Chimbote increased from 4,243 in 1940 to between 60,000 and 100,000 in 1960 and that of Supe from 1,644 in 1940 to approximately 6,000 in 1960 21/.

Labor Adjustments

The labor adjustments are related to two elements of the labor force: quality and quantity.

Quality of Labor. Farmers from the highlands and other rural

areas are the labor available for jobs created by the fishing industry. The fishing industry has to train the labor that it needs. The basic and service fishing industries demand a certain degree of skills. For example, working on a boat requires a learning period. The shipyards require carpenters. The maintenance of the boats requires mechanics.

Quantity of Labor. The jobs created by the fishing industry are not sufficient in number to absorb the labor force that has migrated into the coastal fishing communities. The resulting tough job competition tends to keep the wages low.

Summary

The foregoing analysis of the impact of the Peruvian fishing activities on Peruvian coastal communities reveals both advantages and problems.

The development of basic and service fishing industries in the coastal communities has created job opportunities which have partially helped to relieve the national unemployment problem with better paid industrial jobs. They have supplied a new source of foreign exchange, diversifying the base of the Peruvian economy. The governments of the coastal fishing communities have benefited from the increase in the number of costumers for municipal services where these services were available and from the increasing demand for licenses and permits for commercial establishments and new buildings. Problems have also been created by the development of the fishing activities. There is incompatibility of industrial uses with residential, commercial or recreational uses, especially due to the air and water pollution caused

by the fish-processing factories. Misuse of land that threatens the unity of existing developments is common. Land suited and needed for residential or recreational purposes is being converted to industrial sites. The street system of the Peruvian coastal fishing communities lacks efficient major thoroughfares which are now needed. Heavy traffic between the terminal facilities and industrial sites or the north-south main coastal highway is being generated on streets unsuited for such traffic. In the more highly developed fishing communities, street connections of industrial areas with residential areas are inadequate. Not all the fishing communities have adequate utilities. Where utilities do not exist, sewage is dumped into the sea and the off-shore coastal waters are contaminated. In many communities individuals or private enterprises are forced to provide their own water and electric power. Where utilities do exist the limited capacity has put serious limitations on their use. The lack of standards for sewage disposal results in the corrosion of the sewerage system, shortening its life and contaminating off-shore coastal waters. Housing supply in the coastal fishing communities is inadequate. Overcrowding and the appearance of slum residential areas result.

Although the Peruvian fishing industry is a booming industry it brings problems with social and economic implications. Individuals (especially fishermen), and small enterprises working separately are disadvantageously competing with each other. Fishing industries, basic and service, are offering business opportunities that are not being used at all or are being used only partially. These include tin can manufacture, boat manufacture and food manufacture from fish flour.

The fishing industry also needs to improve its economic efficiency. Another problem is the lack of a sufficient number of skilled laborers.

The following chapters will suggest how the opportunities may be captured and the problems solved.

CHAPTER III

A PROGRAM FOR THE IMPROVEMENT AND DEVELOPMENT OF THE PERUVIAN FISHING INDUSTRY

The basic and service fishing industries are made up of both large and small business organizations. Large organizations, such as the "Consorcio Pesquero" have been formed. This latter organization, comprised of a majority of the fish-processing enterprises, represents the Peruvian fishing industry as a unit in the world fish and fish-products markets. Examples of small organizations are the small groups of fishermen working as fish suppliers to a local processing plant.

The growth of the fishing industry has created business opportunities that have been neglected. A program for the maximum exploitation of these neglected opportunities and for the improvement of the fishing industry as a whole is the subject of this chapter.

Industrial Development Tools

Some of the required industrial development tools already exist. These include the Industrial Bank and the Industrial Promotion Law. However these tools need periodic adjustment to the changing industrial scene of Peru. Other development tools, such as the Development Corporation, are in the proposal stage.

The Industrial Bank

The Industrial Bank has been operating in Peru since 1937 22/.

During this period the bank has been aiding industrial development through conservative loans which have been made in small amounts for terms of from four to five years 23/. Fishing industries, basic and service, have utilized these loans to advantage.

The Industrial Bank should assume a greater measure of leadership in industrial development in Peru. This task can be accomplished if the bank increases its operating capital, liberalizes its loans, and becomes a dynamic industrial promoter.

The national government has already taken two steps to increase the operating capital of the bank. Recent legislation assigned to the bank certain customs revenues and permitted the bank to pay up to 12 per cent dividends on its shares exempted from income taxes, in order to attract more investors 24/. Other sources from which the bank can obtain capital are: (1) international lending institutions such as the World Bank; (2) insurance companies who might be required by law to invest a percentage of their reserves in the Industrial Bank; and (3) government loans 25/.

Along with an increase in operating capital the lending policy of the Industrial Bank should be liberalized by increasing the amount of a loan that may be made (to $150,000 for small industrial projects and $700,000 for large industrial projects), and enlarging the period of loan repayment to ten years 25/.

The bank can become a dynamic industrial promoter if it is allowed to put in practice new policies such as: lowering interest rates; investing in shares of industrial enterprises; and underwriting new industrial companies in order to speed up the capital formation of such

companies 26/.

The Industrial Promotion Law

The Industrial Promotion Law+ aims to promote capital investment in industry. It seeks to do this by providing tax exemptions for new industrial enterprises. The exemptions apply for not more than three years from the beginning of production 27/. This period is often too short because it may take five years or more to put a new industry into sound economic operation. Therefore, the exemption period should be extended to up to seven or ten years as in Puerto Rico 27/. The fishing industries (both basic and service) that are in process of organization should apply to the Ministry of Finance for the tax exemptions presently authorized by the Industrial Promotion Law.

The industrial development incentives provided by the Industrial Promotion Law, should be broadened by: (1) granting tax exemptions for reinvestment of profits; and (2) making tax payments on corporate real estate at least as great as tax payments on income from industrial investments 28/.

The Development Corporation

A valuable study++ presenting a recommended program for the industrial and regional development of Peru includes the following recommendations for the establishment of a development corporation for Peru:

> An economic development corporation [should] be established by the government, for the purpose of performing the necessary

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+ Law No. 13270, enacted November 30, 1959.

++ Arthur D. Little Inc., A Program for the Industrial and Regional Development of Peru. Lima, Peru: Talleres Graficos, Pacific Press S. A., 1960.

economic development functions, including resource exploitation, economic research, regional planning, industrial development and investment attraction 29/.

The essential requirements for the success of the development corporation, as presented in the report, are: acceptance by all sectors of the community; strong leadership (bankers, business leaders, and labor leaders); technical staff and technical assistance which can be obtained, if needed, from international organizations for industrial development such as the United Nations Bureau of Technical Assistance Operations and the Economic Commission for Latin America; cooperation of the ministries of the government; and an adequate budget 30/.

The proposed development corporation would contain five departments devoted to:

1. Economic research;
2. Planning and statistics;
3. Resource exploration and development;
4. Tourism; and
5. Industrial promotion 31/.

It would be headed by a joint Government-private business board with broad powers to carry out the functions of the corporation.

A proposed nation-wide industrial development program for the proposed development corporation is presented in detail in the report. The logical steps for implementing the recommended industrial development program are:

1. Establish the development corporation by an Act of Congress and empower it to carry out its functions;

2. Improve investment-attraction incentives;

3. Use tariffs as a development tool;

4. Improve the labor situation; and

5. Increase available capital 32/.

Promotion of the Economic Activities of the Fishing Industry

A program for the promotion of activities directly related to the fishing industry should include the following elements:

1. The formation or enlargement of fishing industry enterprises;

2. The conduct of research; and

3. The improvement of the labor force.

The Formation or Enlargement of Fishing Industry Enterprises

Plans for the formation or enlargement of fishing industry enterprises should concentrate initially on the small operations. They are comprised in part of individuals working by themselves, such as fishermen in small fishing communities. Other small enterprises include the operation of a small number of fishing boats or a fish distribution business with a small number of trucks.

These individuals and small enterprises might advantageously be organized into cooperatives. The use of cooperatives in Peru is widespread, especially among farmers. Cooperatives would allow individuals and small enterprises to finance more efficient equipment (for example, larger and better equipped fishing boats). Cooperatives could distribute the catch and make market transactions more economically and advantageously than can individual fishermen. For example, a factory

might gladly contract for the supply of fish with a group of fishermen organized as a cooperative or other business unit.

Cooperatives and other well organized enterprises can bring benefits to their participants in the form of increased profits, reduction of maintenance costs, better financing and managerial efficiency. Required financing can be worked out through loans from private banks and the Industrial Bank and through the tax exemptions and other incentives provided in the Industrial Promotion Law. Management efficiency can be increased through training programs and the distribution of information on management and accounting techniques, and through constant checks on the progress of the enterprises.

The private banks and the Industrial Bank should work closely with the National Fishery Society, the Consorcio Pesquero, and the Directory of Cooperatives of the Ministry of Labor and Indian Affairs to: (1) set up qualifications standards for the granting of loans; and (2) to organize supervision, management and accounting training programs. All of these institutions should also be responsible for publicity campaigns to inform interested bodies of the advantages of organized enterprises.

The Conduct of Research

Both technical and economic research are important in the continuous development and promotion of the Peruvian fishing industry. Technical research should be concerned with factory plant operations, production costs, and the technical feasibility of new products.

Research in factory plant operations should investigate: (1) time and motion factors affecting factory design and the quantity of

the production; and (2) the methods of production and machinery in operation that affect the quality of the products. Such research should be undertaken periodically to keep pace with changes in market demands.

Production cost research should seek ways to reduce the cost of production without sacrificing the quality. It should be concerned with such production aspects as administration and labor policies, the distribution of products and the cost of raw materials. Thus, for example, the cost of fish might be reduced by using larger fishing boats, more modern fishing gear and modern fishing techniques that secure an increase in catch per vessel. Another possibility for reducing the cost of fish is the use of storage plants. By preserving the fish caught when they are abundant and withdrawing them when they are scarce, industry could avoid sharp fluctuations of prices. The canning industry could reduce the cost of canned fish if the cost of raw fish could be reduced, factory operations improved, and the cost of containers lowered 33/.

Research to develop new products and by-products from fish is important. Two subjects for needed continuing technical research are: (a) the manufacture of fish flour for human consumption, which has an economic potential in Peru as well as in the whole world 34/+, and (b)

+ Experiments in the use of fish flour for human consumption are being undertaken in Sweden, the United States, Canada, Germany and Chile, as well as in Peru 35/. In Mexico since 1960, a whole town has been consuming bread, crackers, and noodles manufactured from fish flour 35/. In Lima, Peru, since January 1961, the Investigation Center of Infant Nutrition has been experimenting with positive results in the use of fish flour in children's diets 36/.

the concentration of stickwater in order to increase the output of fish flour[++].

Needed economic research includes: (1) feasibility studies and market analyses to determine the economic possibilities of introducing new fish process products into both foreign and domestic markets; and (2) evaluations and improvements of selling techniques. The latter might include research in advertising and public education campaigns through distribution of pertinent information, fish food contests, and test areas for selling experiments.

Market analyses and research in selling techniques should evaluate public acceptance of the products or existing prejudices against them.

The Improvement of the Labor Force

The improvement of the labor force is vital to all Peruvian industry, including the fishing industry. The latter needs trained workers in such trades as electricity, carpentry, plumbing, and mechanics. It also needs trained managers and supervisors.

Although the amount of labor available in the fishing communities exceeds the job opportunities, the available laborers are largely unskilled. Therefore there is an immediate need for a program to increase their skills. This program should include short- and long-range measures.

Short-range measures include on-the-job and short pre-employment

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++ There are already two proven methods of concentrating stickwater into fish flour: a vacuum process method and a combined method of vacuum and pressure 37/.

training courses.

Long-range measures include training courses that should be offered on a continuing basis into the indefinite future. These training courses have to be adjusted to the level of education of the labor pool which on the average is the first grade of elementary school. This imposes a severe limit on labor training possibilities. A very basic measure to enhance the economy of Peru is to raise as quickly as possible the level of education of its citizens.

Employers, labor unions, the Ministry of Labor and Indian Affairs, and the Ministry of Education all have important roles to play in raising the quality of the available labor pool. The employers should propose to the labor organizations training programs to improve the skills of the labor pool, and should jointly adopt and implement the programs which are considered necessary. The Ministry of Labor and Indian Affairs and the Ministry of Education (Directory of Technical Education), should be requested to assess and supervise the training courses.

Conclusion

If the required development tools are strengthened or established where lacking, if they are fully utilized, and if there are vigorous programs for the promotion of the economic activities of the fishing industry, Peru can look forward to increasing economic strength for its abundant fishery resources.

CHAPTER IV

PLANS FOR PERUVIAN COASTAL FISHING COMMUNITIES

If Peruvian coastal fishing communities are to achieve their optimum development, they must adopt continuous planning programs. These planning programs should include among other things, population and economic base analysis, and plans for future land use, transportation, utilities and housing. The first step in developing such planning programs is to study the government of these communities and the present planning activity.

Government of Peruvian Communities

Peru has a strong central government. It is divided by functions into ministries and by areas (as related to communities) into municipalities. As a result, the planning and providing of services and facilities in coastal communities is done by various ministries and national institutes or offices, and by municipalities. In performing their functions at the local level, the ministries and national institutes or offices are carrying out national rather than local policies. Although the municipality works as a branch of the national government and its alcalde (mayor) is appointed by the national government, its policies are more locally oriented.

Ministry of Development and Public Works

The Ministry of Development and Public Works more than any other ministry is responsible for the development of the communities.

It does so through directories. Although the programs of these directories are coordinated at the national level, they act independently of each other at the local level.

Directory of Roads. Upon request by the municipal government of a community, the Directory of Roads prepares plans for streets and major thoroughfares and constructs, within the limits of its budget, those it considers most important.

Directory of Sanitary Works. Upon request by the municipal government of a community, the Directory of Sanitary Works prepares plans for water and sewerage systems and constructs those it considers most important and economically feasible.

Directory of Industry and Electricity. Upon request by the municipal government of a community, the Directory of Industry and Electricity prepares plans for electric power systems and constructs those it considers most important and economically feasible. The same approach is followed by this directory in planning and constructing docks and other port facilities.

Ministry of Public Health

The Directory of Environmental Health of the Ministry of Public Health establishes the sanitary requirements and carries out, upon request by the municipal government of a community, sanitation programs necessary for the healthful development of the community.

National Housing Institute

The coastal fishing communities, as well as the rest of Peruvian communities, through their municipal governments, request from the

National Housing Institute the solution of their housing problems. This housing institute, as established in the Supreme Decree No. 48 given in June 1, 1962, plans, finances, constructs, and administers those low-cost housing projects it considers most important, within the limits of its budget.

National Office of Tourism

The plans and construction of tourist facilities such as hotels and recreation centers is one of the functions of the National Office of Tourism. These plans are subjected to feasibility studies of the tourist possibilities of the proposed resort areas, and their promotion through improvement programs and advertisement campaigns.

Municipal Governments

The present role of the municipal governments in the development of the Peruvian communities is mainly limited, in the majority of the communities, to administrative and regulatory functions except for the function of identifying and requesting (from the national agencies) needed improvements.

The administrative functions include the maintenance of utilities (water supply and sewage disposal), streets, parks, public buildings, and other urban improvement such as housing projects. This maintenance starts after ministries and other national agencies have completed the facilities and delegated the administration of such improvements to the municipal government of a community.

The regulatory function includes the enforcement of codes and regulations such as the housing code and subdivision regulations.

The municipalities inform the national governments of desired public works in the communities. For example, if a community feels the need of a sewerage system, the municipal government so informs the Directory of Sanitary Works of the Ministry of Development and Public Works which is responsible for the planning and construction of the sewerage system. If studies prove it necessary and economically feasible, the Directory constructs the proposed sewerage system.

Present Planning Activity

Peru does not have an agency at the national level that coordinates the activities of the directories, institutes or offices responsible for the physical development of the Peruvian communities. Each national agency, almost individually undertakes the necessary studies to determine whether the construction of a project is necessary and economically feasible. These studies are limited almost entirely to an engineering study of a specific project.

At present the Peruvian communities do not have land use, transportation, utilities, and other plans to guide their physical development in a comprehensive continuous basis. Recently the municiple governments of the largest communities of Peru, such as Lima and Trujillo, who have enough urban problems and financial capabilities to justify a planning department, have organized such departments to identify needed improvements by a comprehensive approach to the urban problems of the communities.

The existing system of planning operations by ministries, combined with the lack of plans to guide the growth of the communities,

produces a piece meal solution of the urban problems of the Peruvian communities. Thus the coastal communities, as well as the rest of the Peruvian communities, are in need of a program that will prepare and administer coordinated planning measures to guide their future growth.

Proposed Planning Program

The main objectives of a planning program should be to prepare, adopt, and execute comprehensive planning measures. The comprehensive planning measures that the Peruvian coastal communities need are: Population and economic base studies, and plans for land use, transportation, utilities, and housing. Effective planning agencies and the preparation, adoption, and execution of these planning measures are the subjects of these sections.

Planning Agencies

Planning agencies should be established at the national and local levels. At the local level there should be a municipal planning department and at the national level a planning directory.

Municipal Planning Department. Each municipality should try to establish a planning department that could operate within the limit of the city's budget. This planning department should be directly responsible to the municipal council and at the same level as other municipal departments. This status as a department would allow close communication between the planning department and the council which is representative of the community and its desires. The planning department could also seek the cooperation of other municipal departments.

The main function of the municipal planning department would be to work as an advisory body to the municipal council, presenting it with comprehensive and coordinated plans to meet community needs and problems. These coordinated solutions would be helpful to the council in its policy decisions and should be a comprehensive guide to the growth of the community.

A planning department to perform this role must gather and analyze available information concerning community needs and problems. These analyses would form the basis for the preparation of planning measures such as the land use, transportation, utilities and housing plans. The municipal planning departments should call upon the School of Planning and Urbanism of the National University of Engineering for any needed consultation regarding analyses of data or preparation of plans. The preparation of these plans should be made according to planning standards established by the Planning Directory.

Planning Directory. A Planning Directory should be established at the national level within the Ministry of Development and Public Works. The establishment of this directory would improve present planning activities at the national level by relating them to comprehensive plans of each community. Another advantage of the Planning Directory would be that it could improve cooperation among other directories or national agencies concerned with community planning.

The main function of the Planning Directory should be:

1. To establish standards to guide the preparation of population and economic base studies; the land use

plans, transportation plans, utilities plans, and housing plans;

2. To distribute planning information, and to assist and guide municipal planning departments in planning matters. This assistance or guidance should be supplied upon request by the municipal planning department, and should guide the analysis of local planning information and the preparation of comprehensive plans;
3. To prepare plans in special cases, where the municipal government does not have a planning department;
4. To approve plans prepared by the municipal planning departments;
5. To coordinate the plans and services of the various national agencies for the communities to make certain that they are not in conflict with the comprehensive plans of the communities. This would require that any plans prepared by a national agency for projects within any community be reviewed and approved by the Planning Directory prior to their execution.

Proposed Studies and Plans

Coastal fishing communities, as well as other Peruvian communities, should have studies of their population and economic base, and plans for land use, transportation, utilities, and housing.

Population Studies. Studies should be prepared indicating the number, characteristics, location, and trends of the population of a community. Knowledge of these population factors is necessary to

determine: the amount of land needed for various types of development; the size of water, sewer, and electric supply systems; the demand for housing; and the need for parks and other community facilities and services.

Two types of population studies are necessary for the Peruvian communities: current population estimates and projections of future growth. Current population estimates are short-range estimates of population figures for the years between the last census count and the forthcoming census count. These projections should be based on the natural growth (excess of resident births over resident deaths) of the community, modified to take into account inmigration and outmigration movements generally connected with economic and employment changes. Projections of future growth are long-range forecasts based on past census counts and economic and social trends. These forecasts are made to predict the population of a community for 20 or 30 years in advance. These long-range forecasts should also take into account the migration movements of the population that would result from expected long-range economic developments.

Both types of population studies should consider social and economic characteristics of the community such as sex, age groups, family formation, degree of education and income per person and per family.

Economic Base Studies. The purposes of economic base studies of a community are to determine the present economic assets and their potential for future expansion and to anticipate the development of new economic activities. The economic base studies of a community and

surrounding areas should cover analyses of:

1. Existing and potential markets for goods and services;
2. The economic importance of the basic and service industries of the community, taking in account the private plans for industrial expansion and retail growth;
3. The labor force, including its composition by sex, age and degree of education and training;
4. Natural resources, such as minerals and tourist attractions, as potential sources of new industrial and trade activities;
5. The availability of power and transportation facilities as prime tools for industrial expansion and new economic development;
6. The existing taxation system and its effects on local business and industry; and
7. Existing financial resources, both private or governmental, of the community and surrounding area as necessary tools for the economic development of the community.

Economic base studies should be prepared by extracting information from the existing sources of business and economic statistics. This information should be complemented with data obtained from interviewing businessmen in the community.

Land Use Plan. The purpose of the land use plan for a community is to establish the basis for a functional organization of the uses of the land of that community. This organization of land use may be obtained in the Peruvian coastal fishing communities mainly by:

1. Avoiding the establishment of incompatible land uses and either eliminating those that exist or reducing their effect on surrounding uses; and
2. Controlling the future use of the land, following policies and standards applicable to each community.

To accomplish these broad objectives a comprehensive land use study should be made. This study should include a detailed evaluation of existing land use conditions, to be used as base for future developments.

A comprehensive land use study of Peruvian fishing communities should include:

1. A compilation, evaluation and mapping of the physiographic features of the urban setting. This study should emphasize the evaluation of the shoreline's characteristics. This calls for: (a) a study of the shoreline including topographical maps and cross sections of the shore 38/; (b) a tidal study indicating water level fluctuations and direction of the sea movement 38/; and (c) a wind direction study. Data on physiographic features are important in planning future ports, port improvements, and factory locations.
2. An existing land use survey. A land use survey records the pattern of existing land uses in any community. This survey should be as detailed as the complexity of the community requires. Since the life of Peruvian coastal communities is centered around fish related activities (fishing and fish

processing), the land use survey of these communities should emphasize the waterfront. The land use of the waterfront should be classified into: uses associated with commercial navigation including terminals, terminals facilities, loading and unloading facilities and fish processing industries 39/; uses associated with recreational use of the water such as bathing beach facilities (parking area, dressing rooms, refreshment stands), and marinas (boat harbors and boat service stations) 40/; and uses desiring visual access to the seashore including residential locations, parks and other community recreation centers 41/. Land uses in the rest of the community should be classified as residential, commercial, industrial, public, or semipublic. Land use relationships should be evaluated to establish the degree of compatibility of land uses throughout the community. In doing so the land use study should consider standards and regulations established by the National Technical Commission on Pollution* for the location of fish processing factories.

3. A study of vacant land and land values. This study should be useful to coastal fishing communities as a guide to the advance acquisition of land by governmental agencies for

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* The National Technical Commission on Pollution was enabled by the Contamination Law (Law No. 14084) enacted by Congress in May, 1962 to deal with pollution problems all over Peru.

future projects such as roads, housing, and schools; and as a help for property tax reevaluation studies.

4. A study of aesthetic conditions in the urban area. The study of the aesthetic conditions of the coastal fishing communities should identify aesthetic features such as beaches or scenic views worth preserving and evaluate land use relationships to determine unpleasant situations created by incompatible land uses such as the effect on residential areas of air polution from nearby industrial areas, or noise of a marina operation and of water pollution of recreation areas from nearby industry 42/.

The findings of the land use studies should be mapped to identify the growth of the community in a particular direction and the accessibility and suitability of land for different uses. An evaluation of these land use factors together with a consideration of population and economic projections, will furnish a realistic framework for estimating the future use of land. This future use of land is shown on a future land use map.

A municipal planning department or the Planning Directory, when preparing a land use plan, should use national and local agencies connected with local planning as sources of information. The National Housing Institute is required by law to cooperate in land use studies.*

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* The National Housing Institute has the duty to cooperate in urban studies that can help to minimize the housing problem. This is established in Decree No. 48, Title I, Article No. 3, June 1, 1962, defining the organization and functions of the National Housing Institute.

Citizen participation should also be considered in the preparation of the land use plan. Citizens, either individually or as organized groups (civic organizations, clubs, political parties), can help by compiling data for the needed surveys and supplying information pertinent to particular land use problems.

Local governments or the Planning Directory on behalf of understaffed local governments, when implementing the land use plan should undertake the updating and enforcement of the plan. The updating should be done periodically in order to correct for any changes in the rate of development of communities. Enforcement of the land use plan should be done after the approval by the Planning Directory of the respective plans and accompanying land use maps. These maps should serve as generalized land use guides for the Peruvian coastal fishing communities. They present desirable future land use, street and major thoroughfare plans. Any new development should comply with the approved land use map. The enforcement of the land use map is basically the enforcement of the land use plan. Communities with adequate local governmental personnel should carry on such enforcement. A regional inspector working for the Planning Directory should be in charge of the enforcement of the land use map in those communities unable to do it for themselves. To supplement the land use map as device for controlling the growth of coastal communities, subdivision regulations should be adopted. The adoption of subdivision regulations is mainly the responsibility of the local governments.

Transportation Plan. The purpose of a transportation plan is to

indicate those facilities that would afford easy and efficient movement of people and goods. The Peruvian communities can achieve such movement of people and goods provided:

1. Adequate terminal facilities are available;
2. A system of major thoroughfares is available, connecting terminal facilities with industrial locations, with residential and commercial areas and with other regions; and
3. A system of local streets complementing the major thoroughfares within the different areas of the communities is available.

To accomplish these broad objectives it is necessary to analyze the present transportation system as a basis for a future transportation plan. Transportation in the coastal fishing communities is mainly centered around two factors:

1. Terminals. The study of the terminals should be concerned with: (a) an evaluation of the existing terminal facilities such as wharves, piers, cranes, and storage rooms; and (b) an evaluation of the trends in the movement of raw and processed fish. These evaluations should be complemented by a consideration of the terminal requirements of other local and regional resources and other industries.
2. Traffic facilities. The analysis of traffic facilities is included in the usual transportation study of any community. This analysis should be undertaken according to the type and quality of the existing transportation facilities and the expected transportation improvements in any community.

It is obvious that a small community with only one main road does not require all the transportation studies outlined below. However, for a comprehensive transportation plan the following transportation studies are necessary: (a) a street use study. The street use study identifies all the streets according to their use as local streets, collectors, major streets, and highways. This study helps to produce a street map that should be updated periodically; (b) and origin and destination study. This study needs to be combined with the land use study to determine the traffic generated by various areas within the community. This information is needed to understand the pattern of movement into, withinm and through communities at different hours of the day; (c) existing traffic volume study. This study evaluates the volumes and types of traffic; and (d) an inventory of the street system. This inventory evaluates the quality of the existing street system as a basis for maintenance and improvement programs that may be necessary in the future.

The evaluation of existing transportation facilities resulting from these transportation studies must be modified in order to consider future transportation needs resulting from population growth, future land use plans, density of desired developments and trends in vehicle

registration.* The findings of these studies are used to prepare a proposed future transportation system plan.

As indicated in the explanation of the land use plan, the agency in charge of the transportation plan for a particular community should use national and local agencies connected with planning as sources of information. In any case, whether the study is made by a municipal planning department or by the Planning Directory, citizen participation in the form of civic groups should be sought, especially for the field work.

The implementation of the transportation plan should be done through the enforcement of locally adopted subdivision regulations and the future major road map. This map combined with the future land use map should be the guide for new road and street projects. The map should be approved by the Planning Directory. The enforcement of the map should be the responsibility of the local governments or the Planning Directory in the case of understaffed local governments.

Utilities Plan. The purpose of the utilities plan is to provide the already developed urban areas and the areas with prospective urban developments with the essential municipal services: water supply, sewerage and electric power. The Peruvian coastal fishing communities need such services to encourage industrial development and to avoid pollution problems.

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* At present the Peruvian coastal communities do not have a parking problem. However, with the increase of population and income per family, automobile registration will increase. This will mean parking demands that should be taken into account before they become a problem.

The provision of utilities for the Peruvian coastal communities should come as a result of feasibility studies coordinated with the future land use and transportation plans.

Feasibility studies should evaluate the technical and economic feasibility of meeting the demand for water, sewerage facilities, and electricity. Studies of this type have already been prepared by the National Fund for Economic Development 43/. This fund made possible the studies and financing of water and sewage services, including water treatment plants, for 80 urban centers in northern and northeastern Peru 43/. Some of these urban centers are coastal fishing communities.

The coordination of the utilities studies with future land use and transportation plans is relevant because utilities must serve efficiently the areas where the development is going to occur. This fact requires a careful consideration of the timing and density of the expected development.

Housing Plan. The purpose of a housing plan is to satisfy the housing demand so that every family may have a housing unit meeting adopted minimum standards. This plan in a Peruvian coastal community would require the elimination and prevention of the factors causing overcrowding and slum areas.

The first step in preparing a housing plan is to establish minimum housing standards. These standards should be influenced by conditions of climate and terrain. The second step is to conduct a housing survey. The housing survey should include:

1. A determination of the number of the housing units needed at the time of the survey and annually for the foreseeable future The number of needed housing units can be estimated by subtracting the number of existing units meeting minimum standards from the total number of units the community needs at the time of the survey.* The yearly demand of housing units could be estimated on the basis of population projections (current or long-range) affected by factors such as rate of construction per year, trends of family formation, and occupancy density.
2. The number of housing units needing rehabilitation. This number would be the number of housing units that need to be repaired in order to meet adopted housing standards.
3. The types of housing needed by families of varying income and costs of construction. This information is necessary especially to encourage the design and construction of housing units that can be afforded by families in the lower income brackets.

As a result of housing studies a housing plan is prepared which outlines a program for furnishing adequate housing. An important part of a program for adequate housing is the control of existing and future housing by housing codes.

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* The total number of housing units needed at the time of the survey could be estimated by dividing the present population of the community by the average number of persons per family in the community.

Housing codes should include minimum housing standards, designate the responsibilities of both owners and tenants, and provide for enforcement. They should be clear, concise, just and easily understood by all. They should cover three main subjects:

1. Minimum facilities and equipment which are required in each dwelling unit. These include: ventilation and heating; lighting; garbage and waste disposal; water supply and sewage disposal; sink, bath, and toilet; and egress 45/.
2. Maintenance of the dwelling unit, facilities and equipment. This includes: general sanitary conditions of dwelling unit; sanitary and heating equipment; electrical wiring, pest control; internal and external structural repair, and dampness control 45/.
3. Conditions of occupancy of the dwelling unit. These include: control of crowding by limiting the number of persons per room or persons per bedroom; provisions for the separation of sexes; and controlling the mixing of living units with business 45/.

The implementation of the housing plan is the responsibility of the National Housing Institute in coordination with the Planning Directory and the municipal planning departments. At present the National Housing Institute is financing housing projects through funds that the national government makes available to the Institute. Two successful projects sponsored and financed by the institute are the low cost

housing developments of "El Trapecio" and "Ventanilla" in the port cities of Chimbote and Callao respectively. "El Trapecio" is a self-sufficient neighborhood of 1,068 families in the outskirts of Chimbote 46/, and "Ventanilla" is a comprehensive urban community of 70,000 people in the vicinity of Callao 47/. The Housing Institute and the Planning Directory should coordinate efforts to accomplish similar housing projects in compliance with the comprehensive plans of other municipalities.

In developing a housing program, local governments should: (a) cooperate with the National Housing Institute in gathering necessary housing information; (b) promote and supply technical assistance for housing construction and housing rehabilitation programs; and (c) adopt and enforce the housing codes. When a community lacks the necessary personnel the Planning Directory in coordination with the National Housing Institute should carry out any necessary functions.

Conclusion

Organized growth of coastal fishing communities as well as the growth of the rest of the Peruvian communities depends on the adoption and implementation of comprehensive plans for development with short and long-range goals.

To facilitate comprehensive community planning, the proposed Planning Directory and municipal planning departments should be established.

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